

What is claimed is:

1. A printing device, comprising:

a plurality of print stations including dot-forming elements arranged to produce an image on a moving recording medium and provided in a redundant manner, thereby enabling dot-forming-element activity to be distributed between redundant dot-forming elements and errors of dot-forming elements to be compensated;

a lateral-position detector arrangement or predictor arranged to indicate the recording medium's lateral position relative to the print stations during a print process; and

a controller arranged to use at least one print mask for each print station arranged to distribute the dot-forming-element activity between the print stations and to compensate the errors of dot-forming elements; wherein

the printing device is arranged so that, in response to a detected or predicted change of the relative lateral position, at least one of the currently used print masks is replaced by another one relating to the changed relative lateral position.

2. The printing device of claim 1, further comprising:

a conveyor arranged to move the recording medium during the print process.

3. The printing device of claim 2, wherein the conveyor is a belt conveyor.

4. The printing device of claim 2, wherein the lateral-position detector arrangement is arranged to detect the conveyor's lateral position, which represents an indication of the recording medium's lateral position.

1 5. The printing device of claim 1, further comprising:
2 a plurality of encoding marks which move with the moving recording me-
3 dium and are indicative of the recording medium's lateral position;
4 wherein the lateral-position detector arrangement comprises at least one
5 sensor responsive to the encoding marks and arranged to detect the re-
6 cording medium's lateral position.

7
8 6. The printing device of claim 1, wherein
9 at least some of the print masks are correlated, wherein the printing de-
10 vice is arranged so that, in response to a detected or predicted change of the
11 relative lateral position, the correlated print masks relating to the changed
12 relative lateral position are replaced by others.

13
14 7. The printing device of claim 1, wherein
15 the lateral-position detector arrangement or predictor is arranged to at
16 least indicate the lateral position of the recording medium from page to page
17 during the print process; and
18 the printing device is arranged so that, in response to a detected or pre-
19 dicted change of the relative lateral position, the at least one of the currently
20 used print masks is replaced from page to page by another one relating to the
21 changed relative lateral position.

22
23 8. The printing device of claim 1, wherein
24 the lateral-position detector arrangement or predictor is arranged to indi-
25 cate the lateral position of the recording medium within a page during the print
26 process; and
27 the printing device is arranged so that, in response to a detected or pre-
28 dicted change of the relative lateral position, the at least one of the currently
29 used print masks is replaced within the page by another one relating to the
30 changed relative lateral position.

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1 9. The printing device of claim 1, further comprising:
2 a print-mask memory arranged to store print masks for different relative
3 lateral recording medium's positions; wherein
4 the controller is arranged, in response to a detected or predicted change
5 of the relative lateral position, to use at least one other print mask from the
6 stored print masks than the currently used one, this at least one other print
7 mask relating to the changed relative lateral position.

8
9 10. The printing device of claim 1, further comprising:
10 a dot-forming-element error detector;
11 wherein the printing device is arranged, in response to newly detected
12 dot-forming-element errors, to replace existing print masks by new print
13 masks which also compensate the newly detected dot-forming-element er-
14 rors.

15
16 11. The printing device of claim 1, wherein the print masks of redundant
17 print stations associated with each other are complementary patterns mini-
18 mizing or reducing blocks of contiguous dots or picture elements printed by
19 each print station.

20
21 12. The printing device of claim 1, wherein the print masks of two re-
22 dundant print stations associated with each other are complementary check-
23 erboard-like patterns.

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25 13. The printing device of claim 1, where the printing device is a multi-
26 color printer.

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28 14. The printing device of claim 1, where the printing device is an ink-jet
29 printer.

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31 15. The printing device of claim 1, where the printing device is a page-
32 wide-array printer.

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1 16. A printing device, comprising:

2 a plurality of print stations including dot-forming elements arranged to
3 produce an image on a moving recording medium and provided in a redun-
4 dant manner, thereby enabling dot-forming-element activity to be distributed
5 between redundant dot-forming elements and errors of dot-forming elements
6 to be compensated;

7 a lateral-position detector arrangement or predictor arranged to indicate
8 the recording medium's lateral position relative to the print stations during a
9 print process; and

10 a controller arranged to use at least one print mask for each print station
11 arranged to distribute the dot-forming-element activity between the print sta-
12 tions and to compensate the errors of dot-forming elements; and

13 a print-mask memory arranged to store print masks for different relative
14 lateral recording medium's positions; wherein

15 the controller is arranged, in response to a detected or predicted change
16 of the relative lateral position, to use at least one other print mask from the
17 stored print masks than the currently used one, this at least one other print
18 mask relating to the changed relative lateral position.

19

20 17. The printing device of claim 16, wherein

21 at least some of the print masks are correlated,

22 wherein the controller is arranged, in response to a detected or pre-
23 dicted change of the relative lateral position, to use other correlated print
24 masks from the stored print masks than the currently used ones, these other
25 ones relating to the changed relative lateral position.

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1 18. The printing device of claim 16, wherein
2 the lateral-position detector arrangement or predictor is arranged to at
3 least indicate the lateral position of the recording medium from page to page
4 during the print process; and
5 the controller is arranged, in response to a detected or predicted change
6 of the relative lateral position, to use, from page to page, at least one other
7 print mask from the stored print masks than the currently used one, this at
8 least one other print mask relating to the changed relative lateral position.

9

10 19. The printing device of claim 16, wherein
11 the lateral-position detector arrangement or predictor is arranged to indi-
12 cate the lateral position of the recording medium within a page during the print
13 process; and
14 the controller is arranged, in response to a detected or predicted change
15 of the relative lateral position, to use, within the page, at least one other print
16 mask from the stored print masks than the currently used one, this at least
17 one other print mask relating to the changed relative lateral position.

18

19 20. The printing device of claim 16, further comprising:

20 a dot-forming-element error detector;

21 wherein the printing device is arranged, in response to newly detected
22 dot-forming-element errors, to replace existing stored print masks for the dif-
23 ferent relative lateral recording medium's positions by new print masks for the
24 different relative lateral recording medium's positions which also compensate
25 the newly detected dot-forming-element errors, and store the new print mask
26 in the print-mask memory.

1 21. A printing device, comprising:

2 at least one print station including dot-forming elements arranged to
3 produce an image on a moving recording medium;

4 a drum arranged to convey the recording medium past the at least one
5 print station, wherein, by performing more than one turn, the drum is enabled
6 to convey the recording medium more than once past the at least one print
7 station, thereby creating an effective dot-forming-element redundancy;

8 a lateral-shift mechanism arranged to perform a relative lateral shift be-
9 tween the print station and the recording medium from one drum turn to an-
10 other drum turn, thereby enabling dot-forming-element activity to be distrib-
11 uted between drum turns and errors of dot-forming elements to be compen-
12 sated;

13 a lateral-position detector arrangement or predictor arranged to indicate
14 the relative lateral shift between the recording medium and the print station;
15 and

16 a controller arranged to use at least one print mask for the at least one
17 print station for each drum turn and each detected or predicted relative lateral
18 position between the print station and the recording medium, wherein the print
19 masks are arranged to distribute the dot-forming-element activity between the
20 drum turns and, in addition, to compensate the errors of dot-forming ele-
21 ments.

22

23 22. The printing device of claim 21, wherein the lateral-position detector
24 arrangement is arranged to detect the drum's lateral position, which repre-
25 sents an indication of the recording medium's lateral position.

26

27 23. The printing device of claim 21, wherein the lateral-position detector
28 arrangement is arranged to directly detect the recording medium's lateral po-
29 sition.

30

31 24. The printing device of claim 21, wherein the lateral-position detector
32 arrangement is arranged to detect the print station's lateral position.

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1 25. The printing device of claim 21, wherein
2 at least some of the print masks are correlated, wherein the printing de-
3 vice is arranged so that, in response to a detected or predicted change of the
4 relative lateral position, the correlated print masks relating to the changed
5 relative lateral position are replaced by others.

6

7 26. The printing device of claim 21, wherein
8 the lateral-position detector arrangement or predictor is arranged to at
9 least indicate the relative lateral position of the recording medium from drum
10 turn to drum turn during the print process.

11

12 27. The printing device of claim 21, wherein
13 the lateral-position detector arrangement or predictor is arranged to indi-
14 cate the relative lateral position of the recording medium within a drum turn
15 during the print process; and

16 the printing device is arranged so that, in response to a detected or pre-
17 dicted change of the relative lateral position, the at least one of the currently
18 used print masks is replaced within the drum turn by another one relating to
19 the changed relative lateral position.

20

21 28. The printing device of claim 21, further comprising:
22 a print-mask memory arranged to store print masks for different relative
23 lateral recording medium's positions; wherein

24 the controller is arranged, in response to a detected or predicted change
25 of the relative lateral position, to use at least one other print mask from the
26 stored print masks than the currently used one, this at least one other print
27 mask relating to the changed relative lateral position.

28

1 29. The printing device of claim 21, further comprising:

2 a dot-forming-element error detector;

3 wherein the printing device is arranged, in response to newly detected
4 dot-forming-element errors, to replace existing print masks by new print
5 masks which also compensate the newly detected dot-forming-element er-
6 rors.

7

8 30. The printing device of claim 21, wherein the print masks of redun-
9 dant drum turns associated with each other are complementary patterns
10 minimizing or reducing blocks of contiguous dots or picture elements printed
11 during the respective drum turn.

12

13 31. The printing device of claim 21, wherein the print masks of two re-
14 dundant drum turns associated with each other are complementary checker-
15 board-like patterns.

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17 32. The printing device of claim 21, where the printing device is a multi-
18 color printer.

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20 33. The printing device of claim 21, where the printing device is an ink-
21 jet printer.

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23 34. The printing device of claim 21, where the printing device is a page-
24 wide-array printer.

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1 35. A printing device, comprising:

2 at least one print station including dot-forming elements arranged to
3 produce an image on a moving recording medium;

4 a drum arranged to convey the recording medium past the at least one
5 print station, wherein, by performing more than one turn, the drum is enabled
6 to convey the recording medium more than once past the at least one print
7 station, thereby creating an effective dot-forming-element redundancy;

8 a lateral-shift mechanism arranged to perform a relative lateral shift be-
9 tween the print station and the recording medium from one drum turn to an-
10 other drum turn, thereby enabling dot-forming-element activity to be distrib-
11 uted between drum turns and errors of dot-forming elements to be compen-
12 sated;

13 a lateral-position detector arrangement or predictor arranged to indicate
14 the recording medium's lateral position relative to the print station;

15 a print-mask memory arranged to store print masks for each drum turn
16 and each detected or predicted relative lateral position between the print sta-
17 tion and the recording medium, wherein the print masks are arranged to dis-
18 tribute the dot-forming-element activity between the drum turns and in addi-
19 tion to compensate the errors of dot-forming elements; and

20 a controller arranged to use at least one print mask from the stored print
21 masks for the at least one print station during the printing operation.

22

23 36. The printing device of claim 35, wherein

24 at least some of the print masks are correlated,

25 wherein the controller is arranged, in response to a detected or pre-
26 dicted change of the relative lateral position, to use other correlated print
27 masks from the stored print masks than the currently used ones, these other
28 ones relating to the changed relative lateral position.

29

1 37. The printing device of claim 35, wherein
2 the lateral-position detector arrangement or predictor is arranged to at
3 least indicate the lateral position of the recording medium from drum turn to
4 drum turn during the print process; and
5 the controller is arranged, in response to a detected or predicted change
6 of the relative lateral position, to use, from drum turn to drum turn, at least
7 one other print mask from the stored print masks than the currently used one,
8 this at least one other print mask relating to the changed relative lateral posi-
9 tion.

10

11 38. The printing device of claim 35, wherein
12 the lateral-position detector arrangement or predictor is arranged to indi-
13 cate the lateral position of the recording medium within a drum turn during the
14 print process; and
15 the controller is arranged, in response to a detected or predicted change
16 of the relative lateral position, to use, within the drum turn, at least one other
17 print mask from the stored print masks than the currently used one, this at
18 least one other print mask relating to the changed relative lateral position.

19

20 39. The printing device of claim 35, further comprising:
21 a dot-forming-element error detector;
22 wherein the printing device is arranged, in response to newly detected
23 dot-forming-element errors, to replace existing stored print masks for the dif-
24 ferent relative lateral recording medium's positions by new print masks for the
25 different relative lateral recording medium's positions which also compensate
26 the newly detected dot-forming-element errors, and store the new print mask
27 in the print-mask memory.

28

1 40. A method of compensating lateral position changes of a moving re-
2 cording medium during a print process, in which at least one image is printed
3 by a plurality of print stations including dot-forming elements, based on image
4 data, wherein redundant dot-forming elements are provided, thereby enabling
5 dot-forming-element activity to be distributed between redundant dot-forming
6 elements, and errors of dot-forming elements to be compensated, by using
7 print masks; comprising:

8 detecting or predicting the lateral position of the recording medium rela-
9 tive to the print stations during a print process;

10 using the image data and at least one print mask for each print station to
11 distribute the dot-forming-element activity between the print stations and to
12 compensate the errors of dot-forming elements; and

13 replacing, in response to a detected or predicted change of the relative
14 lateral position, at least one of the currently used print masks by another one
15 relating to the changed relative lateral position.

16
17 41. The method of Claim 40, the step of replacing at least one of the
18 currently used print masks, further comprises the step of, in response to the
19 detected or predicted change of the lateral position between a first and a sec-
20 ond print stations of said plurality of print stations, shifting the image data to
21 be printed by said second print station.

22

1 42. A method of compensating lateral position changes of a moving re-
2 cording medium during a print process, in which at least one image is printed
3 by a plurality of print stations including dot-forming elements, based on image
4 data, wherein redundant dot-forming elements are provided, thereby enabling
5 dot-forming-element activity to be distributed between redundant dot-forming
6 elements, and errors of dot-forming elements to be compensated, by using
7 print masks, wherein a set of such print masks for different relative lateral po-
8 sitions of the recording medium is pre-calculated and stored; comprising:

9 detecting or predicting the lateral position of the recording medium rela-
10 tive to the print stations during a print process;

11 using the image data and at least one print mask for each print station to
12 distribute the dot-forming-element activity between the print stations and to
13 compensate the errors of dot-forming elements; and

14 using, in response to a detected or predicted change of the relative lat-
15 eral position, at least one other print mask from the stored print masks than
16 the currently used one, this at least one other print mask relating to the
17 changed relative lateral position.

18
19 43. The method of Claim 42, the step of using at least one other print
20 masks, further comprises the step of, in response to the changed relative lat-
21 eral position between a first and a second print stations of said plurality of
22 print stations, shifting the image data to be printed by said second print sta-
23 tion.

24

1 44. A method of compensating lateral relative position changes of a
2 moving recording medium during a print process, in which at least one image
3 is printed, based on image data, by at least one print station of a drum system
4 during more than one drum turn, wherein effective dot-forming-element re-
5 dundancy is created by executing additional drum turns and laterally shifting
6 the print station between drum turns, thereby enabling dot-forming-element
7 activity to be distributed between the drum turns and errors of dot-forming
8 elements to be compensated, by using print masks; comprising:

9 detecting or predicting the lateral position of the recording medium rela-
10 tive to the at least one print station during a print process;

11 using the image data and at least one print mask for each print station
12 for each drum turn and detected or predicted relative lateral position between
13 the print station and the recording medium, wherein the print masks distribute
14 dot-forming-element activity between the drum turns and, in addition, com-
15 pensate the errors of dot-forming elements.

16
17 45. The method of Claim 44, the using step further comprises the step
18 of, in response to the detected or predicted change of the lateral position be-
19 tween a first and a second drum turn of said more than one turns, shifting the
20 image data to be printed by said print station during said second turn.

21

1 46. A method of compensating lateral relative position changes of a
2 moving recording medium during a print process, in which at least one image
3 is printed, based on image data, by at least one print station of a drum system
4 during more than one drum turn, wherein effective dot-forming-element re-
5 dundancy is created by executing additional drum turns and laterally shifting
6 the print station between drum turns, thereby enabling dot-forming-element
7 activity to be distributed between the drum turns and errors of dot-forming
8 elements to be compensated, by using print masks, wherein a set of such
9 print masks for different relative lateral positions of the recording medium is
10 pre-calculated and stored; comprising:

11 detecting or predicting the lateral position of the recording medium rela-
12 tive to the at least one print station during a print process;

13 using the image data and at least one print mask from the stored print
14 masks for each print station for each drum turn and detected or predicted
15 relative lateral position between the print station and the recording medium,
16 wherein the print masks distribute dot-forming-element activity between the
17 drum turns and, in addition, compensate the errors of dot-forming elements.

18
19 47. The method of Claim 46, the using step further comprises the step
20 of, in response to the detected or predicted relative lateral position between a
21 first and a second drum turn of said more than one turns, shifting the image
22 data to be printed by said print station during said second turn